

ABSTRACT

Methods for repairing an electrical circuit; compositions, inks and equipment for making such repairs; and repair structures formed by the methods. The method generally includes the steps of: (a) depositing a composition comprising nanoparticles of an electrically functional material such that it contacts first and second elements of the circuit; and (b) sufficiently irradiating at least part of the composition with light to fuse or bind the nanoparticles to each other. The composition and ink generally comprise such nanoparticles and a sensitizer having a light absorption maximum at a wavelength different from that of the nanoparticles. The apparatus comprises: (1) a deposition apparatus configured to deposit a liquid film of an electrically functional material on the circuit; (2) a light source configured to irradiate at least part of the thin film; and (3) a table configured to secure the substrate. The structure generally comprises a circuit element having an electrical disconnect, and a cured electrically functional material (i) in electrical contact with first and second locations on the circuit elements adjacent to the disconnect, and (ii) forming a continuous electrical path between the disconnected circuit portions. The present invention provides a fast, reliable method for repairing electrical circuits. The repair structures have electrical properties similar to the corresponding bulk or sheet materials. The invention is well suited for use with existing circuit inspection and testing equipment, thereby providing a "one tool" solution to testing and repairing electrical circuits.